

Effect of different classes of antihypertensive drugs on central and peripheral pressure in a young patient with hypertension — clinical case

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Summary

In recent years, it has been shown that the central pressure correlated with cardiovascular risk and, better than peripheral pressure, provides the risk of serious cardiovascular events. It is known that blood pressure and pulse wave shape are different in different sections of the arterial tree. This difference is related to the age sex, incidence of heart disease, concomitant cardiovascular disease, diabetes, renal failure, used drugs. In young people, with flexible walls of the vessels, the difference between the circumferential pressure, measured at the upper limb and the central pressure can range from a few to over twenty mmHg. In this context, we present a case of a young patient with hypertension treated with antihypertensive fixed dose combination drug.

key words: hypertension, central pressure

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23-year-old patient with arterial hypertension diagnosed a year ago was admitted to the Hypertension Department for the purpose of diagnostic tests for secondary causes of hypertension. The patient complained of unstable blood pressure, periodic increases in BP to 160/100 mmHg, despite regular treatment with metoprolol 50 mg daily. 6 weeks before the scheduled diagnostics, patient set oral hormonal contraceptive preparations. The examination revealed overweight, pale skin, stretch marks on thighs, mid-systolic click in mitral valve auscultation area, and high blood pressure.

There was no significant deviations in the laboratory tests (serum: sodium: 141 mmol/l [N: 135–145], potassium 4.90 mmol/l [N: 3.50–5.50]; sodium and potassium in the urine collection: sodium 168.30 mmol/24h [N: 40.00–220.00], potassium 55.73 mmol/24h

[N: 25.00–125.00]; microalbuminuria: 8.10 mg/day [N: < 30.00 mg/24h]; ACR 3.48 mg/g; plasma renin activity: 3.37 ng/ml/h [N: 0.51–2.64]; plasma renin activity after administration of 2000 ml of 0.9% NaCl: 1.09 ng/ml/h [N: 0.26–1.32]; aldosterone — basic conditions: 102.00 pg/ml [N: 10–160]; aldosterone after administration of 2000 ml of 0.9% NaCl: 35.00 pg/ml [N: 6–75]; metanephrine urine collection: 18 g/24 h [N: 350]). The test results did not reveal potential causes of secondary of hypertension. Only echocardiography revealed flabby anterior leaflet of mitral valve. Angio-CT of the abdomen revealed a small, 2 mm lodgement in the right renal upper calyx (Figure 1). The average Ambulatory Blood Pressure Monitoring (ABPM) blood pressure values were: 141/85 mmHg, up to 184/113 mmHg (Figure 2). The

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Figure 1. Angio-CT of the abdomen revealed a small, 2 mm, lodge-ment in right renal upper calyx (Source: Department of *Diagnostic Imaging and Interventional Radiology*, Pomeranian Medical University, Szczecin, 2014. Courtesy of Prof. Walecka)

patient was discharged home with the instruction to take antihypertensive therapy — combined preparation of bisoprolol and amlodipine in daily doses of 5 and 5 mg. Follow-up ABPM, taken after 2 months, showed marked improvement (Figure 3). Importantly, pulse wave analysis conducted using the applanation tonometry method showed normalization of central pressure, compared with baseline examination (Figure 4).

In recent years, it has been shown that the central pressure correlated with cardiovascular risk and, better than peripheral pressure, predicts the risk of serious cardiovascular events [1–6]. It is known that blood pressure and pulse wave shape are different in different sections of the arterial tree. This difference is related to the age, sex, incidence of heart disease, concomitant cardiovascular disease, diabetes, renal

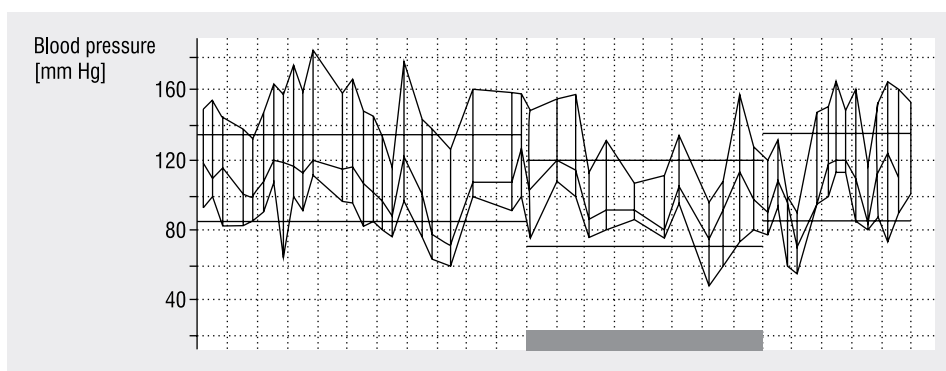


Figure 2. ABPM before modifying treatment: metoprolol 50 mg/day (Source: Department of *Hypertensiology and Internal Medicine*, Pomeranian Medical University, 2014)

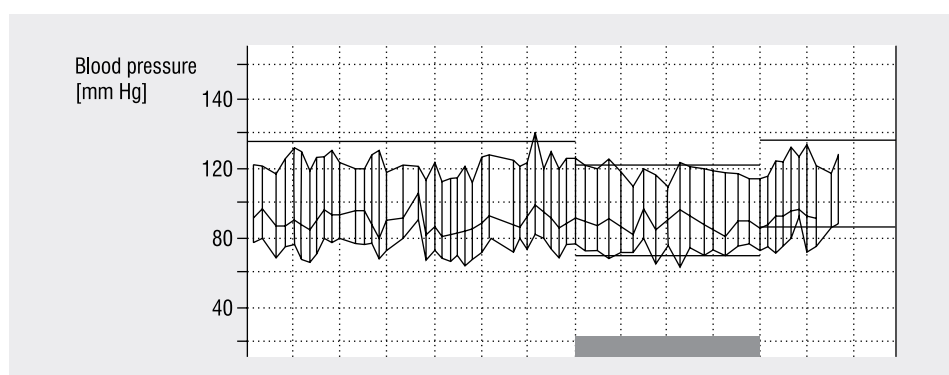


Figure 3. ABPM after modification of treatment: bisoprolol/amlodipine 5/5 mg/day (Source: Department of *Hypertensiology and Internal Medicine*, Pomeranian Medical University, 2014)

failure, and used drugs [1, 7]. In young people, with flexible walls of the vessels, the difference between the peripheral pressure, measured at the upper limb, and the central pressure can range from a few to over

twenty mmHg [1, 8]. The result achieved in our patient seems to be consistent with current scientific reports, which clearly confirms the differences in effect on central pressure of different groups

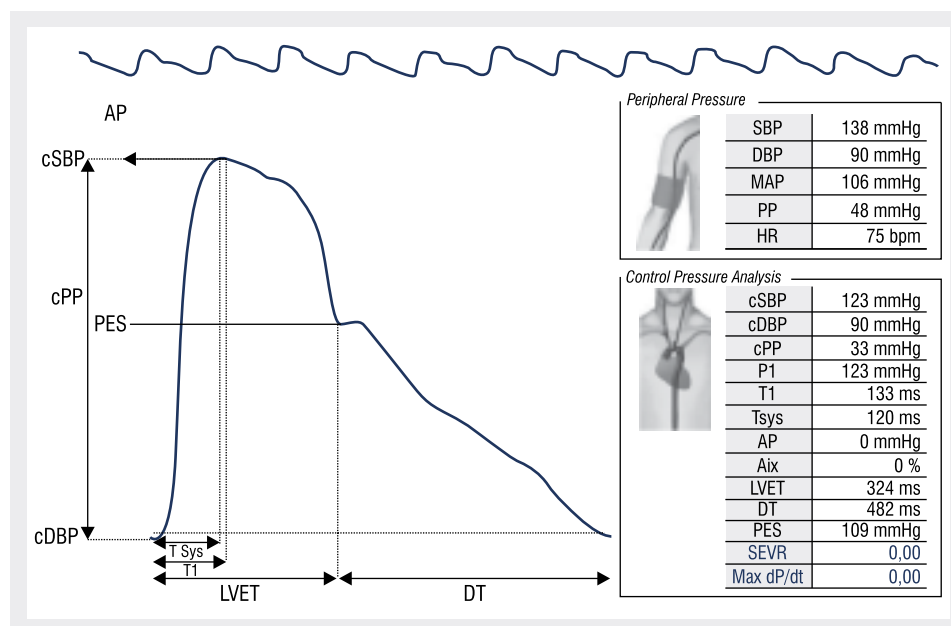


Figure 4. The central pressure curve (Source: Department of Hypertensiology and Internal Medicine, 2014)

of antihypertensive drugs. In this context, have a beneficial effect of angiotensin-converting enzyme inhibitors (ACEI), beta-blockers and amlodipine [9–11]. The first mechanism leading to differences is possible different effects of different drug classes on the speed of the pulse wave velocity (PWV) (best documented is beneficial effect of ACEI on PWV). The second mechanism is the ability to change the pressure wave reflection site distance under the influence of drugs used. Vasodilators such as angiotensin converting enzyme inhibitors, angiotensin receptor blockers or calcium channel blockers move away wave reflection points, while vasoconstrictor drugs and most of the beta-blockers and diuretics — bring them closer. A third potential mechanism is the extended duration of the contraction of the left ventricle as a result of the negative chronotropic action of some drugs (beta-blockers and calcium channel blockers) [14].

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